

# SB - 820 - Regulation requirements 1, 2, 7 & 19

By Charles Holbrook

## Overview

These **Rules and Regulations** conform to best industry practices and generally accepted standards for operations, procedures and quality of materials and apply to both vertical and horizontal drilling for oil and natural gas and associated operations in the state of North Carolina and are designed to protect its citizens and environmental resources. The **Rules** further require the operator to provide **DENR** with a complete record of all such operations together with copies of the data generated.

This document outlines both specific performance practices and the result to be achieved with specific tests to confirm acceptable margins of safety. If and whenever conditions are encountered in the course of complex oil and gas operations that are not covered, the operator is required to consult with the **Department of Environment & Natural Resources (DENR)** and, unless waived, follow the Current and Applicable standards, Recommended Practices and Specifications established by **the American Petroleum Institute (API)** and the **American Society of Testing Materials (ASTM)**. Some of these are contained in the publications listed below. The terms **Current and Applicable** will always apply since standards, practices and specifications are revised from time to time to remain consistent with technological, legal, operational and other changes.

- ② (a) API Specification 5B, *Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads*
- ② (b) API Specification 5CT/ISO 11960, *Specification for Casing and Tubing*
- ② (c) API Specification 10A/ISO 10426-1, *Specifications for Cements and Materials for Well Cementing*
- ② (d) API Recommended Practice 10B-2/ISO 10426-2, *Recommended Practice for Testing Well Cements*
- ② (e) API Recommended Practice 10D-2/ISO 10427-2, *Recommended Practice for Centralizer Placement and Stop Collar Testing*
- ② (f) API Technical Report 10TR1, *Cement Sheath Evaluation*
- ② (g) API Technical Report 10TR4, *Technical Report on Considerations Regarding Selection of Centralizers for Primary Cementing Operations*
- ② (h) API Recommended Practice 65-2, *Isolating Potential Flow Zones During Well Construction*
- ② (i) API Recommended Practice 90, *Annular Casing Pressure Management for Offshore Wells*

**See API Standard 65 – Part 2, Second Addition, December 2010, for a more thorough list of reference API Documents related to Well Construction.**

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## **(1) Regulation of pre-drilling exploration activities, including seismic and other geophysical and stratigraphic surveys and testing.**

Pre-drilling exploration activities involve the collection and analysis of seismic and other types of geophysical data, sampling of surface materials through borings, baseline studies, and, possibly, even test drilling to assess the physical, geochemical and other characteristics of the objective rocks. Such information allows oil and gas companies to evaluate the potential for economic accumulations of oil and/or natural gas and to determine the optimum locations for drilling, for access to the property and for the siting of required infrastructure such as drilling pads, earthen pits for fluid containment and sufficient space around the drill site to accommodate the drilling operations and the stockpiling of materials, supplies and equipment required in the conduct of operations as well as to avoid encroachment onto areas excluded from operations for environmental, cultural, set-back or other considerations.

Lease agreements between oil and gas companies and land/mineral owners usually provide for access to the property for the collection of such data and assessment of the physical and geologic environment. In the absence of such an agreement, it is the responsibility of the operator to negotiate terms with the land and/or mineral owner to gain access to the property.

The operator is required to file an application with **DENR** requesting the issuance of a permit for the conduct of geophysical and test drilling exploration activities. Issuance of the permit should not be unreasonably delayed, but issued generally within thirty (30) days from date of receipt of the application in the absence of extenuating or mitigating circumstances: The permit must include;

- (a) The nature and approximate time period for conduct of the operations;
- (b) The requirement that the operator provide written notice to the land owner and mineral owner, if different, a minimum of 15 days in advance of the commencement of operations specifying the nature of the operations and the approximate span of time required to complete same;
- (c) The requirement that **DENR** provide a copy of the permit to the sheriff and/or principal contact for emergency response in the county in which the operations are to be conducted;
- (d) The requirement that the operator disclose the nature and contents of any chemicals, explosives, and other materials to be used in the data gathering process, except for an exclusion for intellectual property, techniques, processes or materials that can be held in confidence by the state until such exclusion shall expire. In no event can the composition of dangerous materials be withheld from emergency

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responders or medical personnel whose responsibility it is to protect the environment, public health and to treat victims of exposure or accidents;

- (e) The requirement that the operator restore and/or compensate the land owner at fair market value plus an inconvenience factor of 10% for unrestored damage or destruction of assets or resources on the property and that to be concluded within 60 days of cessation of operations, unless circumstances do not reasonably allow the completion of said restorations within the stated time period in which case the work should be done in a continuous and expeditious manner;
- (f) The requirement that the operator provide **DENR** one (1) copy and one (1) reproducible original, if different, and digital recordings of all data collected and analyses performed (not to include proprietary interpretations by the operator or its agents), and a base map showing the locations of sampling, seismic shot points, and any other relevant locations such as recording stations for geophysical readings. Such data and other intellectual property are to be held in confidence by **DENR** and not be disclosed to the public, competitors or other outside sources for a period of two years or 60 days following cessation of operations based upon said data, whichever is less.
- (g) **[Insert reference to applicable NC State and Federal Laws and Regulations]**

### **(2) Regulation of drilling, operations, casing, completion and plugging and abandonment of wells.**

The regulatory authority for all exploration and operational activities related to drilling wells in North Carolina for the purposes of extracting oil and/or natural gas resides within **The Department of Environment and Natural Resources (DENR)**. The specific requirements for these operations including site construction, drilling, casing, cementing and completion for production, suspension of operations pending future operations or plugging and abandonment are covered under **Regulation Requirement No. 7** that deals specifically with **Well Integrity and Construction Standards**.

#### **Permitting**

One of the first steps in the regulatory process requires that the operator secure a **Permit to Drill** before any site preparations or drilling operations can begin in the state of North Carolina. The purpose of the permit is to specify the operations to be conducted and to outline the requirements placed upon the operator including notifications and inspections

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and data delivery requirements, and to ensure compliance with all applicable State and Federal laws and regulations.

The operator is required to submit an application to **DENR** for a permit to drill. Issuance of the permit shall not be unreasonably delayed, but generally provided within thirty (30) days from date of receipt of the application in the absence of extenuating or mitigating circumstances.

- (a) The permit application process (**Attach Permit Application Form**) shall include the particulars of the operations, the anticipated commencement and completion dates, the proposed true vertical depth (TVD) and proposed bottom hole location along with the proposed casing and cementing program, safety devices to be installed, etc. with oversight, inspection and certification by an authorized agent of **DENR**. The permit application must also include the name of the operator and all interest holders in the operation together with their respective percentage interest and contact information.
- (b) The operator shall provide **DENR** 24-hours advance notice of each operation in the sequence of events including casing runs and cementing, testing of blow-out preventers, conduct of Formation Integrity Tests (**FIT**) following each casing run, hydraulic fracturing, completion, suspension or plugging and abandonment operations. Any “significant” deviations or change in the permitted plan of operation brought about by extenuating or unanticipated events or occurrences shall require an approved amendment or exception to the permit by **DENR**.
- (c) The approved **Permit to Drill** must specify the site remediation plan upon conclusion of operations along with a Financial Assurance bond posting to ensure financial performance.

## Data Delivery Requirements

The operator is required to provide **DENR** one (1) copy and one (1) reproducible original, if different, and digital recordings, where applicable, of all data collected and analyses performed (not to include proprietary interpretations by the operator or its agents), including, but not limited to: all drilling records; open hole and cased hole well logs; geophysical recordings including base map showing the locations of sampling, seismic shot points, and other relevant locations such as recording stations for other geophysical readings; casing joints, centralizers and cement used; casing shoe tests, cement batch tests, blowout preventer tests, drill stem tests; a cut of the rock samples recovered from the drilling operations, etc. Data and information that falls under **Intellectual Property Rights** are to be held in confidence by **DENR** and not be disclosed to the public, competitors or other outside sources for a period of two years or 60 days following cessation of operations based upon said data, whichever is less.

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## **Standards & Specifications**

All materials and operational procedures used and/or otherwise employed in drilling, testing, and completion, including, but not limited to, casing, cement, connectors, blowout preventers, centralizers, packers, production tubing, tanks or other manmade materials or containers used for storage of solid, liquid or gaseous materials must comply with best practices for soundness, quality and durability specified by the **American Petroleum Institute (API)**, and/or **the American Society of Testing Materials (ASTM)** whether or not specifically referenced in these **Rules and Regulations**.

## **Vendor List**

**DENR** should develop a list of approved vendors authorized to perform various operations and services in the state of North Carolina related to oil and gas drilling and producing operations and pre-drilling exploration activities with the purpose of ensuring that such vendors possess an acceptable record for safety and environmental sensitivity. These will include, but are not limited to; drilling, construction, cementing, perforating, testing, logging, hauling, transporting, etc.

**[Insert reference to applicable NC State and Federal Laws and Regulations]**

**(7) Appropriate construction standards for oil and gas wells, which shall address the additional pressures of horizontal drilling and hydraulic fracturing treatments. These rules, at a minimum, shall include standards for casing and cementing sufficient to handle highly pressurized injection of hydraulic fracturing fluids into a well for purposes of fracturing bedrock and extraction of gas, and construction standards for other gas production infrastructure, such as storage pits and tanks.**

## **Casing, Centralizers and Cementing - General**

Well construction standards that ensure well integrity along with control systems that include blowout preventers and diverter systems are essential for safe operations in drilling oil and/or natural gas wells. Any well completed for the production of

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hydrocarbons must have a minimum of two strings of cemented casing separating the well bore from any fresh water or other protected zones. Successively smaller diameter casing is set and cemented inside earlier casing runs to complete a multi-stage barrier of steel casing and cement to separate the contents of the well bore from the rock section penetrated in the drilling.

- (a) All casing including casing couplers to be installed in a well must be steel or other approved material and manufactured and tested to comply with current and applicable **API Standards and Specifications** that provide a minimum internal pressure rating greater than the maximum anticipated pressure to which the casing will be exposed including the additional pressures associated with hydraulic fracturing. Used casing must be inspected for any evidence of defects such as pitting, corrosion, wear or thread damage by a qualified inspector and hydrostatically tested to the same standard as for new casing.
- (b) Each casing connections, new or used, must be torqued to manufacture's specifications and **API Recommended Practices** should be followed to preserve the design integrity of the casing.
- (c) Centralizers must be used in each of the casing runs to ensure sufficient standoff from the sides of the well bore to allow effective circulation of the cement around the casing to fill the annular space to prevent annular flow and provide a minimum of a 1" (one inch) sheath of cement around the exterior of the pipe.
- (d) Centralizers include bow-spring, rigid blade and solid designs. The operator is directed to follow current and applicable **API Recommended Practices** when selecting the particular design, the number and spacing of centralizers to ensure their maximum effective utilization for casing installed in vertical, slanted and horizontal portions of the well bore.
- (e) Casing must be cemented to the surface ensuring that the annular space is filled by return of the cement to the surface and verified by volumetric calculations. Unless a four arm caliper is run in the open hole to verify the volume of annular space, an excess of 25% volume of cement is to be used. In the event the cement does not return to the surface, any lapses in cement coverage must be addressed by remedial actions in consultation with **DENR**.
- (f) Casing should be rotated and reciprocated during the cementing process, unless contraindicated, to effectuate the circulation of the cement around the casing to fill all void space and prevent annular flow.
- (g) All cement used in the hole must comply with the current **ASTM Standard** or current **API Specifications and Recommended Practices**. Casing must set undisturbed for the minimum number of hours recommended by the

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manufacturer and in compliance with the current API Standards and Recommended Practices following completion of the cementing operation for the specific cement formulation.

- (h) All cement, mixing fluids and additives must be laboratory tested prior to use to ensure compliance with the design parameters of the well and the mixing, blending and pumping of the cement at the well site supervised by experienced service personnel.
- (i) A Cement Bond Log (**CBL**) or equivalent diagnostic tool must be run in the cased hole following Intermediate and Production Casing runs to ensure an effective cement bond between the casing and the sides of the bore hole and to locate the casing collars and centralizers for future reference. A Cement Bond log may be required after the Surface Casing run to assess the need for remedial cementing if the Formation Integrity Test (**FIT**) or casing shoe test fails to achieve minimum pressure requirements.
- (j) After the cementing operation has been completed, a casing pressure test is performed in all casing runs below the conductor casing to ensure that the casing meets the well design and construction objectives. The well must then be drilled out to a depth below the casing sufficient for running a formation pressure integrity test (**FIT**) or casing shoe test to ensure consistency with the well construction design parameters and consistent with current applicable **API Standards, Specifications and Recommended Practices**. Any deficiencies must be reported to **DENR** and approved corrective actions taken before resumption of drilling operations.

### **Conductor Casing**

- (a) Conductor casing is to be set to a depth of 80 feet below the surface or to other such depth as may be appropriate to isolate and seal off fresh water zones, to stabilize weak or unconsolidated sediments, to isolate any shallow drilling hazards or hydrocarbon bearing zones, including coal beds, and to provide a stable platform for well construction that includes a diverter system, blowout preventer(s) and/or other safety devices, future casing installations and other equipment and fixtures that may be installed to prepare the well for drilling deeper and completion for the production of hydrocarbons.
- (b) Air or fresh water based drilling fluids must be used in drilling the hole in which conductor casing will be set that are free of any hydrocarbon, chemicals or other components that could contaminate fresh water zones. The conductor casing must be cemented to surface ensuring a minimum of

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one inch of cement sheath around the outside perimeter of the casing by volumetric calculations and return of cement at the surface.

## **Surface Casing**

- (a) Surface casing is installed in a drilled hole extending from the surface to a depth of approximately 500 to 2000 feet or to a minimum depth of 100 feet below the deepest identified fresh water zone, to seal off poorly consolidated sediments and any identified drilling hazards, to provide a stable hole condition and platform for future operations in the hole including drilling, completion and producing operations and for surface installations of well control equipment such as blowout preventers, diverter systems and other necessary equipment for safety, drilling and completion operations. The hole must be drilled using air or a fresh water based mud system free of additives that could contaminate fresh water zones. The bottom of the casing must be set in competent rock to provide a secure base for pressure containment.
- (b) Electrical logs and other diagnostic wire line tools are to be run in the open hole prior to surface casing installation to measure and evaluate the rock section penetrated for the purpose of identifying any zones of potential or concern, such as fresh water zones, that require protection and to identify any shallow drilling hazards or hydrocarbon bearing zones including coal beds.
- (c) Although the depth of fresh water zones in prospective areas of North Carolina are not expected to extend deeper than can be protected by normal surface casing runs, should such fresh water zones be identified later below surface casing, they must be protected by subsequent casing runs ensuring that a minimum of two strings of casing separate all fresh water or other protected zones in wells completed for the production of hydrocarbons.

## **Intermediate Casing**

- (a) Intermediate casing strings are sometimes required in drilling to seal off troublesome zones that may include anomalous pressure or zones prone to lost circulation, heaving shale or other potential drilling hazard and to protect any fresh water zones not adequately protected by the surface casing. The definition of intermediate casing implies that, if the well is found to be capable of producing hydrocarbons, a string of production casing will be run and cemented in place.
- (b) Intermediate casing strings must be new and be run and cemented to the surface.
- (c) Electrical logs and other diagnostic wire line tools are to be run in the open hole prior to setting the intermediate casing as required to measure and

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evaluate the rock section penetrated for the purpose of identifying any zones of potential or concern or that require protection including any drilling hazards or hydrocarbon bearing zones.

### **Production Casing**

- (a) Production casing is required for the completion of a well for production of oil and/or natural gas. The casing used for this purpose must be new and be run and cemented continuously from a minimum depth of 100 feet below the deepest zone of potential hydrocarbon production, perforation or hydraulic fracturing (unless the well is approved for open-hole completion) to the surface. If an intermediate string of casing has been run back to the surface providing two strings of cemented casing separating the well bore from any fresh water or other protected zone, the production casing may be run as a liner, but must overlap the intermediate casing by a minimum of 200 feet.
- (b) Electrical logs and other diagnostic wire line tools must to be run in the open hole prior to setting production casing to measure and evaluate the rock section for hydrocarbon bearing zones and any zones that require protection such as drilling hazards.
- (c) Open-hole completions are viable alternatives to running the production casing through the objective formation in either vertical or horizontal wells when the geologic conditions and nature of the rock are suitable for such completions, but will be subject to **DENR** approval. In open-hole completions, the production casing is set at the top of the objective formation and cemented to its top, whether at the surface or its overlap of intermediate casing. The operator may choose to install a slotted, screened or perforated production liner within the open-hole completion zone. In this case, the slotted production liner is screwed to the bottom of the production casing and cement is not required.
- (d) Production tubing and packers are installed in the cased hole for the production of hydrocarbons and offer another level of separation of all produced fluids and gases from communication with the annular space.

### **Blowout Preventer Standards (Existing State Law)**

In all proven areas, the use of blowout preventers shall be in accordance with practices established in drilling the pool under development. In unproven areas, all drilling wells should be equipped with a master gate or equivalent, an adequate blowout preventer and a properly sized flow line valve. "Adequate" shall be taken to mean that consideration has been given to the depth of the test and pressures likely to be encountered at those depths.

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The entire control equipment shall be in good working condition at all times and shall have been tested to working pressures at least 50 percent above the hydrostatic pressures anticipated in the well. (Subchapter 5D – Oil and Gas Conservation, 15A NCAC 05D.0107 Drilling and Completion, paragraph (d)).

### **Earthen Pit Construction & Lining Standards (Current State Law Under Revision)**

Slush or mud pits shall be constructed prior to commencement of drilling operations and should be of adequate size to confine all anticipated drilling mud and cuttings. Precautions should be taken to prevent the contamination of streams and potable water. All such pits should be refilled or otherwise returned to prior condition upon termination of drilling operations. (Subchapter 5D – Oil and Gas Conservation, 15A NCAC 05D.0107 Drilling and Completion, paragraph (f)).

The operator shall not, except in extreme emergencies or with permission of the director, permit oil or salt water to be temporarily stored in earthen reservoirs. (Subchapter 5D – Oil and Gas Conservation, 15A NCAC 05D.0107 Drilling and Completion, paragraph (g)).

### **Storage Tank Standards (Being Developed)**

### **Well Pad Construction Standards (Being Developed)**

## **(19) Require measures to prevent blowouts, caving, and seepage as such terms are generally understood in the oil and gas industry.**

The prevention of blowouts, caving and seepages in oil and gas drilling, hydraulic fracturing and completion operations is inherent in the standards employed in the well integrity design and construction, and in the materials, standards, professionalism, technology and equipment employed in the operational processes. These standards and requirements are addressed in **Regulation Requirement No. 7** section of these **Rules & Regulations**. The well construction casing, cementing and testing requirements are designed to ensure isolation and separation of all fluids and gases in the well bore from communication with any near surface fresh water or other protected zones. Other sections of these **Rules** provide for the capture and approved disposal of all effluents from the well including, but not limited to; rock cuttings, drilling mud, waste water and any other produced fluids whether water, oil or natural gas.

2.25.13